



2021 DWR Acorn Production Report:

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Acorn production across the state in 2021 can be categorized overall as poor for both white and red oak species (Figures 1-4). Both white and red oaks fell well below the long term median over the 29 sites surveyed. On a positive note, most survey routes did have pockets of fair production and anecdotally reports of “bumper” mast crops have been reported across the state, thus emphasizing the variability of quality and production even within a single survey route. Mid to high elevation sites generally had higher productivity this year, particularly for red oak species. While acorn production is variable from year to year for many reasons (weather, insects, tree species), for some of our survey sites we are probably approaching the biological end of production due to tree age. Unfortunately, finding “new” stands of mature oak in the 50-70 year age range is becoming more and more difficult due to aging forests and lack of sufficient regeneration. Replacing aging trees/survey sites could be quite a challenge moving forward.

Production by Region: White Oak (Appendix 1)

- **Mountains:** White oak production across most of the mountain region (16 survey sites) was extremely low. The North Mountain region averaged close to the long term median with better production seen at the higher elevation sites. Several southern mountain routes had pockets of fair production but were overall well below the median. Oak regeneration is a serious conservation issue in all of these areas and ongoing habitat management efforts have been underway by DWR and partner agencies to enhance areas with significant oak decline.
- **Piedmont:** White oak production across the Piedmont (10 sites) varied, but was highest in the Northern Piedmont with an average PCA (percent crowns with acorns) of 30% (above the long term median of 10.2%). The southern Piedmont flipped from 2020 when it was above average and came in well below the long term median in 2021. Anecdotal reports of bumper white oak trees (particularly in more urban areas) have been received from throughout the Piedmont region. These may be worth looking into, especially during the archery season!
- **Tidewater:** The Tidewater area has our lowest sample size with 3 sites and unfortunately all 3 fell below the long term median in 2021. This was to be expected though after 2 out of the 3 sites experienced fairly high productivity in 2020. However, reports of soft mast species in this area (and across the entire state) were well above average, so keying in on Persimmon, crab apple, and wild grapes could pay off in this area.

Production by Region: Red Oak (Appendix 2)

- **Mountains:** Red oak production was sporadic across the mountain region with pockets of average to above average production, particularly at high elevation sites. The southern mountain region had the highest average of trees with positive acorn production, with some individual sites being well above the long term median. Much like the white oak production this year, mid to higher elevation sites trended to better production.
- **Piedmont:** Red oak production was below the long term median in all three Piedmont zones surveyed. Production across all sites trended lower than that found in the mountain region with very few reports of “bumper” crop trees.



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- **Tidewater:** The Tidewater region averaged below the long term median, but did have 1 site (Big Woods WMA) with average red oak production. The other Tidewater sites did report a few pockets of “good to fair” production in slightly drier soils.

The annual hard mast survey has been an ongoing effort between the VA Department of Wildlife Resources and many partner agencies for many years. Many of the mountain survey sites have been in place since the 1950s. In 2021, staff from VA Department of Wildlife Resources, US Forest Service, US Fish and Wildlife Service, DCR, VA Department of Forestry, US Department of Defense/Department of Military Affairs, National Park Service, and Smithsonian Conservation Biology Institute surveyed 28 hard mast production sites across Virginia. Sites are located across all regions of the state, although a majority are currently found in the mountains. Continued efforts are being made to add sites to the Northern Piedmont and Tidewater areas.

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- Figure 1: Statewide white oak acorn production (average percent of tree crowns with acorns), presented as long term median (2007-2021) with 95% confidence intervals.
- Figure 2: Statewide white oak acorn production (PCA) broken into categorical rankings based on 4 group cluster analysis with 95% confidence intervals.
- Figure 3: Statewide red oak acorn production (average percent of tree crowns with acorns), presented as long term median (2007-2021) with 95% confidence intervals.
- Figure 4: Statewide red oak acorn production (PCA) broken into categorical rankings based on 4 group cluster analysis with 95% confidence intervals.

Figure 1: Statewide white oak acorn production (average percent of tree crowns with acorns), presented as long term median (2007-2021) with 95% confidence intervals.

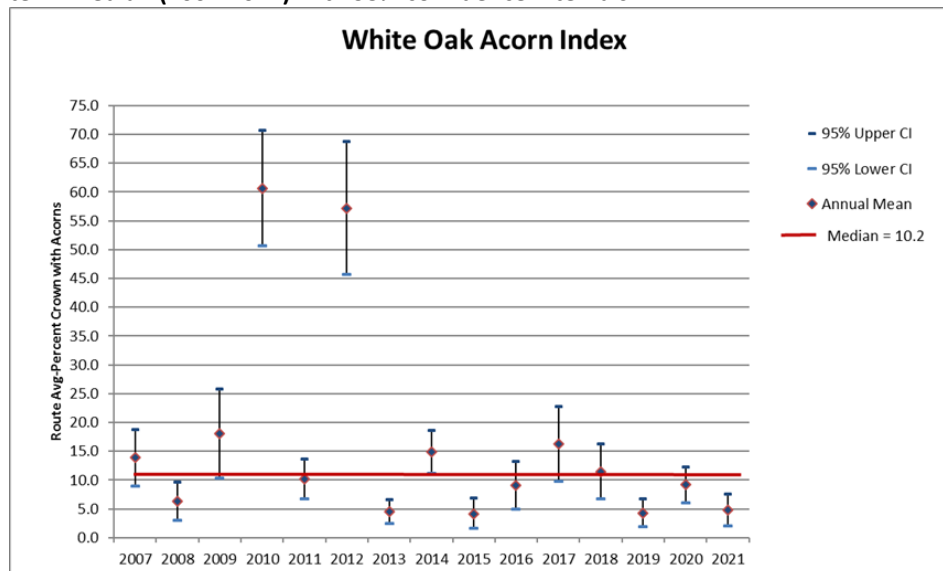




Figure 2: Statewide white oak acorn production (PCA) broken into categorical rankings based on 4 group cluster analysis with 95% confidence intervals.

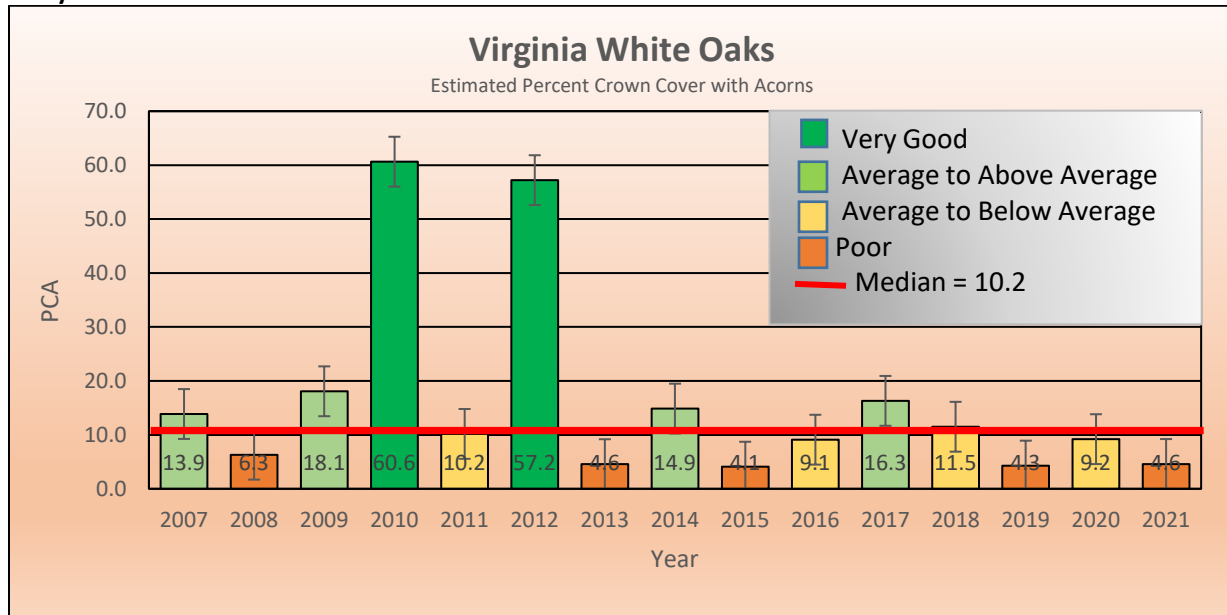


Figure 3: Statewide red oak acorn production (average percent of tree crowns with acorns), presented as long term median (2007-2021) with 95% confidence intervals.

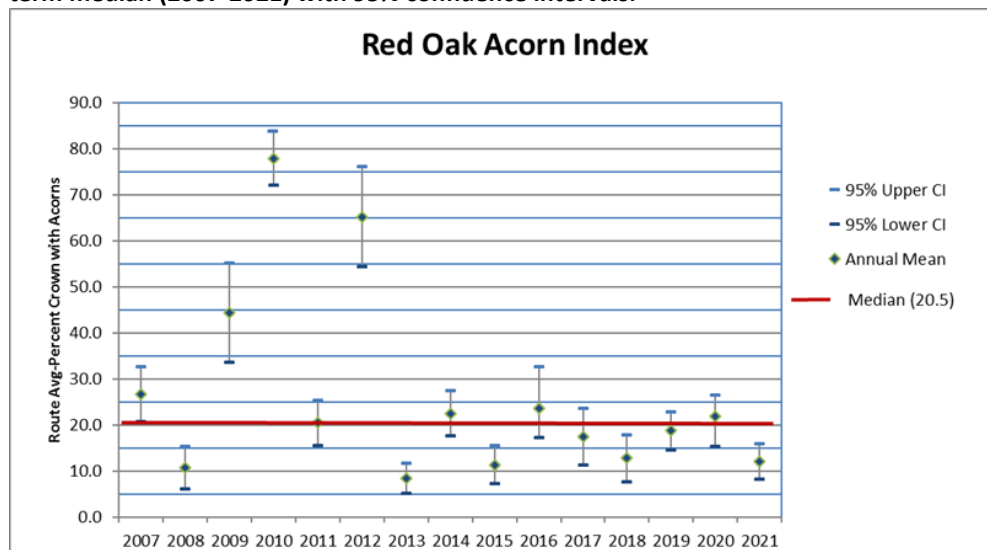
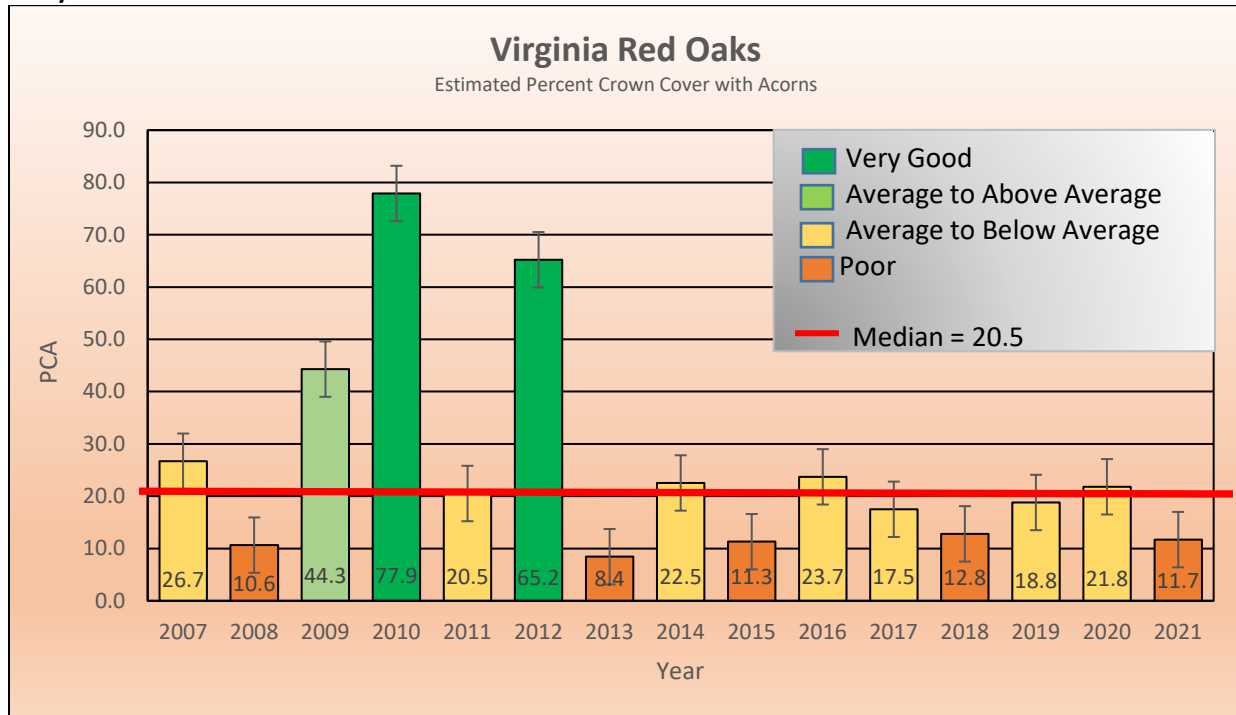




Figure 4: Statewide red oak acorn production (PCA) broken into categorical rankings based on 4 group cluster analysis with 95% confidence intervals.





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Appendix 1: Virginia Mast Survey Sites, White Oak PCA (2007-2021)

			White Oak PCA (Percent of Crown with Acorns)															
Region	Site Number	Site Name	White Oak														2021	2007-21
			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020		
North Mt.	VA-1	Conservation Center	3	1	4	60	1	8	3	8	4	3	28	11	0	0		10
North Mt.	VA-2	Shenandoah NP	40	11	44	56	2	33	4	25	8	2	35	4	1	0	4	18
North Mt.	VA-3	Lee District	22		22	70	1	88			37	1	68		0	0	11	29
North Mt.	VA-4	Rapidan WMA	1	1	17	57	1	37		18	0	12	5					
North Mountain Region			17	4	22	61	1	42	4	17	12	5	34	8	0	0	8	16
Central Mt.	VA-5	Deerfield RD	13	2	10	10	34	32	2		9	0						12
Central Mt.	VA-6	Highland WMA	14	0	8		16	60	5	2	7	4	14		0	1	1	10
Central Mt.	VA-7	Warm Springs RD	13		3	35	2	28	5	8	1	9		19	2	3	4	10
Central Mt.	VA-8	Little North Mt WMA	5	9	18	20	11	18	0	2	8	1	15			1		9
Central Mt.	VA-9	Gathright WMA	1	2	0	28	14	35	9	3	1	2	16		0	2	1	8
Central Mt.	VA-10	James River RD	9	0	13	63	5	30	4	13	1	4	4	18	1	9	3	12
Central Mt.	VA-13	Pedlar RD	2	3	0	38	11	70	1	11	6	3	14	3	1	6	1	11
Central Mt.	VA-17	Glenwood RD	2	6	0	25	12	40	8	0	0	0	0	0	0	0	0	6
Central Mountain Region			7	3	7	31	13	39	4	6	4	3	10	10	1	3	2	10
South Mt.	VA-18	New Castle	22	0	5	38	12	53	0	6	0	4	0	9	0	4	1	10
South Mt.	VA-19	Stoney Creek - Giles C	18	2	5	63	28	60	6	37	1	4	6	1	1	0	1	16
South Mt.	VA-20	Dismal - Giles & Bland	10	5	10	63	18	25	7	19	0	1	2	4	0	1	0	11
South Mt.	VA-24	Round Mt.	23	2	23	88	8	38	9	13	0	8	4	22	1	10	7	17
South Mt.	VA-25	Clinch Mt. WMA	23	18	3	70	13	80	1	8	5	6	11	2	5	17	6	18
South Mt.	VA-26	High Knob	10	2	0	70	0	73	0	9	0	18	3	1	2	1	2	13
South Mt.	VA-27	Walker Mt.	28	2	25	83	2	80	3	26	1	3	1	1	4	3	2	18
South Mt.	VA-28	Mt. Rogers NRA	28	0	0	73	21											
South Mt.	VA-31	Cumberland Gap NP	47	26	63	85	22	100	30	28	3			13	13	22	5	35
South Mountain Region			23	6	15	70	14	64	7	18	1	6	4	7	3	7	3	17
N. Piedmont	VA-30	Quantico MCB	38	1	58	80	10	93	5	11	5	35		50	0	18	37	32
N. Piedmont	VA-32	Ft. Belvoir							0	23	25	36	27	31	23	18	47	26
N. Piedmont	VA-40	Oakley Forest WMA														11	5	
North Piedmont Region			38	1	58	80	10	93	3	17	15	36	27	41	12	16	30	32
C. Piedmont	VA-11	Hardware River WMA	0	21		100	2	90	4		3		50	1	0	6	7	24
C. Piedmont	VA-14	James River WMA	1	1	60	20	5	20	1	14	3	1	32	9	0	19	3	13
C. Piedmont	VA-15	Powhatan WMA	1	20		93	25	100	5	5	5							
C. Piedmont	VA-16	Horsepen WMA	0	21	7	47	5	87	7	8	0	6	30	14	6	16	3	17
C. Piedmont	VA-29	Briery Creek WMA	7		25	95	5	93	6	13	4	22	15	8	15	20	13	24
Central Piedmont Region			2	16	31	71	8	78	5	10	3	10	32	8	5	15	7	20
S. Piedmont	VA-22	White Oak Mt. WMA	15		20	70	8	33	6	39	0	26	11	20	16	19	4	21
S. Piedmont	VA-23	Fairystone Farms WM	6	2	45	98	1	98	5	22	0	21	32	16	15	20	1	25
S. Piedmont	VA-36	Fort Pickett							15	0	22	23	11	8	19	5	13	
South Piedmont Region			11	2	33	84	5	66	6	25	0	23	19	14	13	19	3	21
S. Tidewater	VA-37	Southampton Correctional									1	0	1	4	1	13	1	3
S. Tidewater	VA-38	Hog Island-Steward Tract											0	2	2	0	1	1
S. Tidewater	VA-39	Big Woods WMA												26	3	26	5	15
South Tidewater Region											1	0	1	11	2	13	2	4
State			13.9	6.3	18.1	60.6	10.2	57.2	4.5	12.9	4.1	9.1	16.3	11.5	4.3	9.2	4.6	16.2





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Appendix 2: Virginia Mast Survey Sites, Red Oak PCA (2007-2021)

Red Oak PCA (Percent Crown Cover with Acorns)																		
			Red Oak															
Region	Number	Name	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2007-21
North Mt.	VA-1	Conservation Center	0	2	17	84	1	8	1	39	6	7	18	10	25	11		16
North Mt.	VA-2	Shenandoah NP	23	19	24	64	16	32	5	22	13	5	30	5	8	1	6	18
North Mt.	VA-3	Lee District	11		33	95	7	80			25	41	48		29	16	5	35
North Mt.	VA-4	Rapidan WMA	15	4	8	57	18	87		18	10	5	12					23
North Mountain			12	8	21	75	11	52	3	26	14	15	27	8	21	9	6	20
Central Mt.	VA-5	Deerfield RD	15	2	56	65	9	18	2		0	3						19
Central Mt.	VA-6	Highland WMA	36	4			6	87	7	18	1	36	24		20	17	3	22
Central Mt.	VA-7	Warm Springs RD	39		18	85	11	45	11	43	2	53	67	10	27	43	20	34
Central Mt.	VA-8	Little North Mt WMA	49	10	15	75	33	85	5	24	1	25	14			15		29
Central Mt.	VA-9	Gathright WMA	24	10	28	83	31	43	3	10	1	12	16		6	8	3	20
Central Mt.	VA-10	James River RD	45	5	13	80	30	68	4	57	5	33	48	18	40	55	10	34
Central Mt.	VA-13	Pedlar RD	18	4	3	30	26	85	2	15	15	23	32	9	10	20	20	21
Central Mt.	VA-17	Glenwood RD	24	6	13	85	37	57	10	10	1	4	2	0	0	2	2	17
Central Mountain			31	6	21	72	23	61	6	25	3	24	29	9	17	23	10	24
South Mt.	VA-18	New Castle	15	8	63	88	11	65	2	3	0	43	8	0	3	27	1	22
South Mt.	VA-19	Stoney Creek - Giles Co.	16	27	50	74	4	83	13	21	4	28	9	0	17	22	4	25
South Mt.	VA-20	Dismal - Giles & Bland Co	16	48	78	68	13	38	5	10	30	45	21	0	16	21	1	27
South Mt.	VA-24	Round Mt.	21	32	68	93	12	100	18	8	17	38	24	0	13	38	20	33
South Mt.	VA-25	Clinch Mt. WMA	20	15	43	65	13	73	26	16	7	25	22	4	12	29	31	27
South Mt.	VA-26	High Knob	9	5	48	70	6	58	1	9	4	25	7	0	5	6	1	17
South Mt.	VA-27	Walker Mt.	8	5	35	93	24	73	13	23	5	34	20	2	21	40	40	29
South Mt.	VA-28	Mt. Rogers NRA	11	20	65	80	35											42
South Mt.	VA-31	Cumberland Gap NP	39	12	88	88	26	100	16	28	3		44	28	14	24	22	38
South Mountain			17	19	60	80	16	74	12	15	9	34	19	4	13	26	15	27
N. Piedmont	VA-30	Quantico MCB	36	9	78	75	21	88	2	15	12	24	19	44	19	40	16	33
N. Piedmont	VA-32	Ft. Belvoir							39	39	50	32	8	35	32	27	11	30
N. Piedmont	VA-40	Oakely Forest WMA														11	12	12
North Piedmont			36	9	78	75	21	88	21	27	31	28	14	40	26	26	13	35
C. Piedmont	VA-11	Hardware River WMA	36	0		90	20	95	0				1	9	4	8	25	26
C. Piedmont	VA-14	James River WMA	17	5	50	100	50	88	0	32	41	2	2	19	28	51	1	32
C. Piedmont	VA-15	Powhatan WMA	32	8		78	19	0	0	5								20
C. Piedmont	VA-16	Horsepen WMA	37	6	38	53	7	100	10	40	11	6	3	29	23	14	7	26
C. Piedmont	VA-29	Briery Creek WMA	60		85	85	44	75	13	30	20	19	8	34	19	44	13	39
Central Piedmont			36	5	58	81	28	72	5	27	24	9	4	23	19	29	12	29
S. Piedmont	VA-22	White Oak Mt. WMA	40		46	83	28	40	1	41	13	8	7	10	25	22	8	27
S. Piedmont	VA-23	Fairstone Farms WMA	61	0	90	95	37	55	3	21	31	81	6	20	31	6	15	37
S. Piedmont	VA-36	Ft. Pickett								21	13	5	1	10	21	9	12	12
South Piedmont			51	0	68	89	33	48	2	28	19	31	5	13	26	12	12	29
S. Tidewater	VA-37	Southampton Correctional Center									8	1	3	11	13	4	15	8
S. Tidewater	VA-38	Hog Island-Steward Tract											1	3	7	6	6	5
S. Tidewater	VA-39	Big Woods WMA												22	41	40	20	31
South Tidewater										8	1	2	12		20	17	14	11
State			26.7	10.6	44.3	77.9	20.5	65.2	8.4	22.5	11.3	23.7	17.5	12.8	18.8	21.8	11.7	26.2

